



Motorola 52nd Street Superfund Site Community Advisory Group (CAG) Meeting



Wednesday, November 8, 2006

6:00 p.m. to 8:00 p.m.

ADEQ - Room 250
1110 West Washington
Phoenix, Arizona

MINUTES

Members in Attendance:

Jeanne Lindsay
Ruth Ann Marston
Mary Moore
Doug Tucker

ADEQ Staff in Attendance:

Kris Paschall, Project Manager
David Haag, Project Hydrologist
Linda Mariner, Community Involvement Coordinator

EPA Staff in Attendance:

Janet Rosati, Remedial Project Manager
Viola Cooper, Community Involvement Coordinator
Leah Butler, Remedial Project Manager

ADEQ Contractor:

Bob Forsberg, LFR
John Kivett, LFR

Others in Attendance:

Mario Castaneda
Manfred Plaschke
Jerry Worsham
Judy Heywood
Teresa Olmsted
Barbara Murphy
Tom Suriano
Rene Chase Dufault
Greg Heiland
George Ring
Phil Burke

OU# 07-072

1. **Call to Order and Introductions – Linda Mariner, ADEQ Community Involvement Coordinator**
2. **EPA Follow-up from November 1, 2006 CAG Meeting – Janet Rosati, EPA Project Manager**

Janet Rosati responded to the presentation on the Baker Metal site given by Steve Smith at the November 1, 2006 CAG meeting. Ms. Rosati explained that the reason Baker Metal is a PRP is because the site had detections of TCE and PCE in soils samples collected in 1987 and 1988. These soil samples were not collected by using more rigorous sampling techniques required today to minimize the loss of volatile compounds. The PCE levels exceeded the ADEQ Groundwater Protection Levels. Because of this, EPA required a site investigation and an evaluation of the potential for these chemicals to migrate to groundwater. We discussed with the PRP the possibility of inputting information into a model using a range of amounts spilled to determine if any of these amounts could have impacted groundwater, because records on solvent use were lost in a fire. The VLEACH model is one of a number of models that could be used to perform this analysis. EPA did not direct the PRP to use the VLEACH model, it was their choice. We are currently evaluating their VLEACH report.

3. **Review of Site Geology – John Kivett, LFR, ADEQ Consultant**

See presentations below

4. **OU1 and OU2 Five-Year Review Introduction – Kris Paschall, ADEQ Project Manager**
5. **OU1 and OU2 Five-Year Review Results Presentation – Bob Forsberg and John Kivett, LFR**

See presentation below

4. CALL TO PUBLIC

Mr. Castaneda asked if the two dimensional model will be used to quantify the amount of contaminant in the groundwater to decide what final remedy will be selected and designed. Mr. Haag explained that all sites use estimates because there are so many factors that keep you from getting a completely accurate measure of the contaminant mass that needs to be clean up. Ms. Moore followed up with the comment that it would be better to be able to have a three dimensional map or model which turns the maps to show a kind of cross-section so that the data could be more understandable. A lengthy technical explanation was given for the reasoning behind ADEQ accepting the map (mass) estimates. Mr. Tucker commented that perhaps Ms. Moore was asking if it would be possible to give a rough estimate in a cross-section model so that it would be easier to visualize where the monitor wells data shows the concentrations to be in the groundwater.

Ms. Moore also asked how ADEQ would be integrating the Honeywell remedy. Ms. Paschall stated that she hadn't yet started on the plans for the OU2 feasibility study.

Mr. Castaneda inquired about when ADEQ will decide on the methodology to be used to do an indoor risk inhalation study. Ms. Paschall reported that this was a decision that had to be made at the Director's level, so it was impossible to set a timeframe at this time.

5. Future Meeting Plans

The meeting was concluded with the CAG setting the next meeting tentatively for January 24, 2007 to hear ADEQ's comments to the OU1 Freescale feasibility report from Freescale. Dr. Marston also requested that a representative from the West Van Buren WQARF site be invited to a future CAG meeting to update the CAG on the progress of their investigation on that site and its impact to the Motorola site.

Motorola 52nd Street Superfund Site

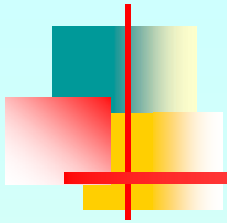
Community Advisory Group
Hydrogeology Presentation
November 8, 2006



**Arizona Department of
Environmental Quality**

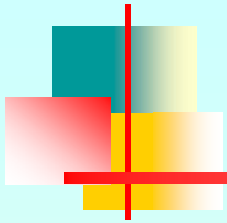


**U.S. Environmental
Protection Agency, Region 9**



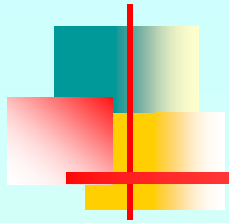
HYDROGEOLOGY: PRESENTAION OVERVIEW

- Hydrogeology Defined...
- The Hydrologic Cycle
- Porosity
- Hydraulic Gradient
- Darcy's Law
- Groundwater Movement
- Groundwater Pumping and Cone of Depression



Hydrogeology Defined...

- Merriam-Webster Dictionary
 - A branch of geology concerned with the occurrence, use, and functions of surface water and groundwater. –
 - Groundwater: Water within the Earth especially that supplies wells and springs.
- Dictionary of Geological Terms
 - The science that deals with subsurface waters and with related geologic aspects of surface water. It is commonly used interchangeably with geohydrology. – Bates and Jackson, 1984,
- United States Geological Survey
 - The subdivision of the science of hydrology that deals with the occurrence, movement, and quality of water beneath the Earth's surface. – Heath, 1995,
- **Hydro + geo + logy: “water” + “earth” + “theory or science”**



The Hydrologic Cycle

- Distribution of the Earth's Water Supply
 - Oceans (saline): 94%
 - Groundwater: 4.12%
 - Ice Caps and Glaciers: 1.65%
 - Surface Water: 0.019%
 - Atmospheric Water: 0.001%

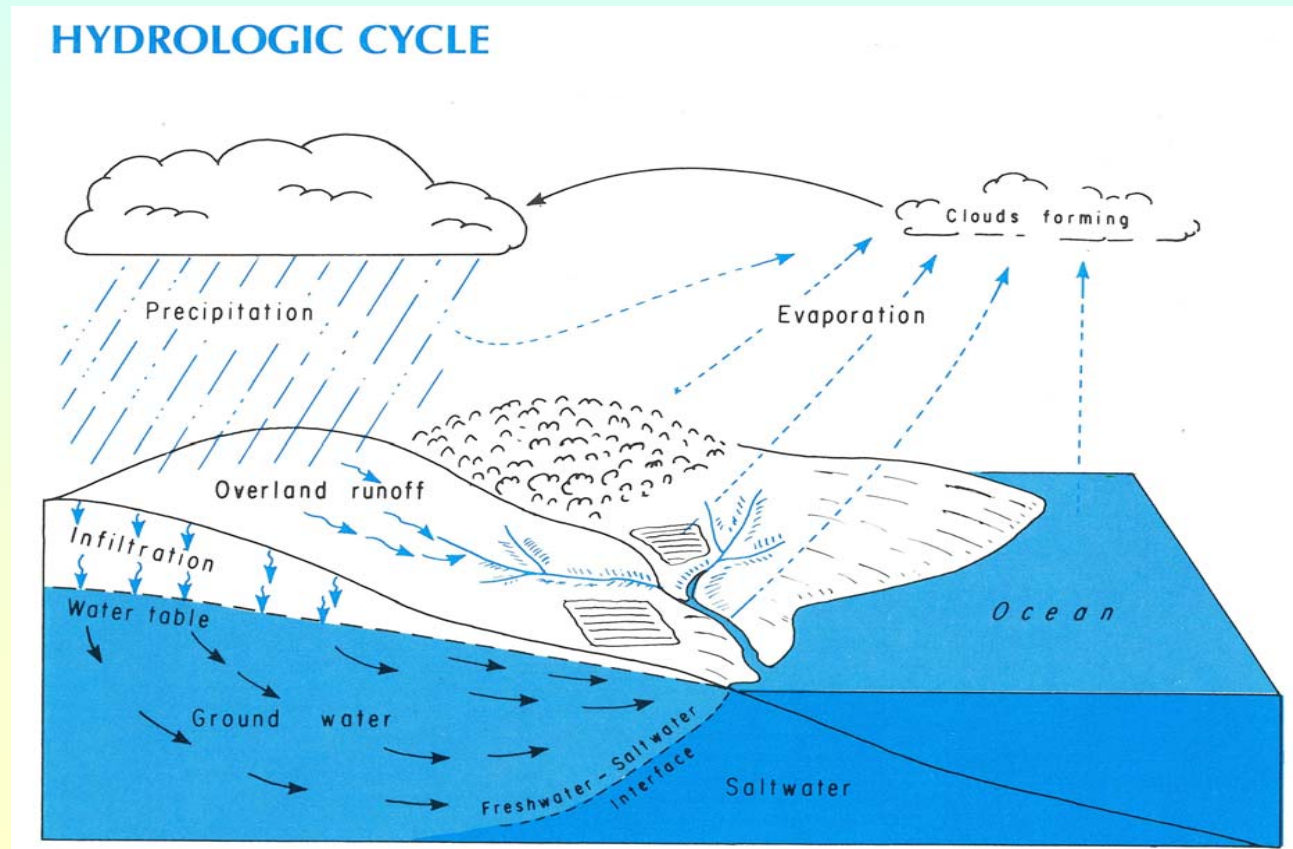
Ref: USGS, 1995

The Hydrologic Cycle

- The continuous cycle of water above, on, and below the Earth's surface.

- Precipitation
- Evaporation
- Runoff
- Infiltration
- Groundwater
- Oceans

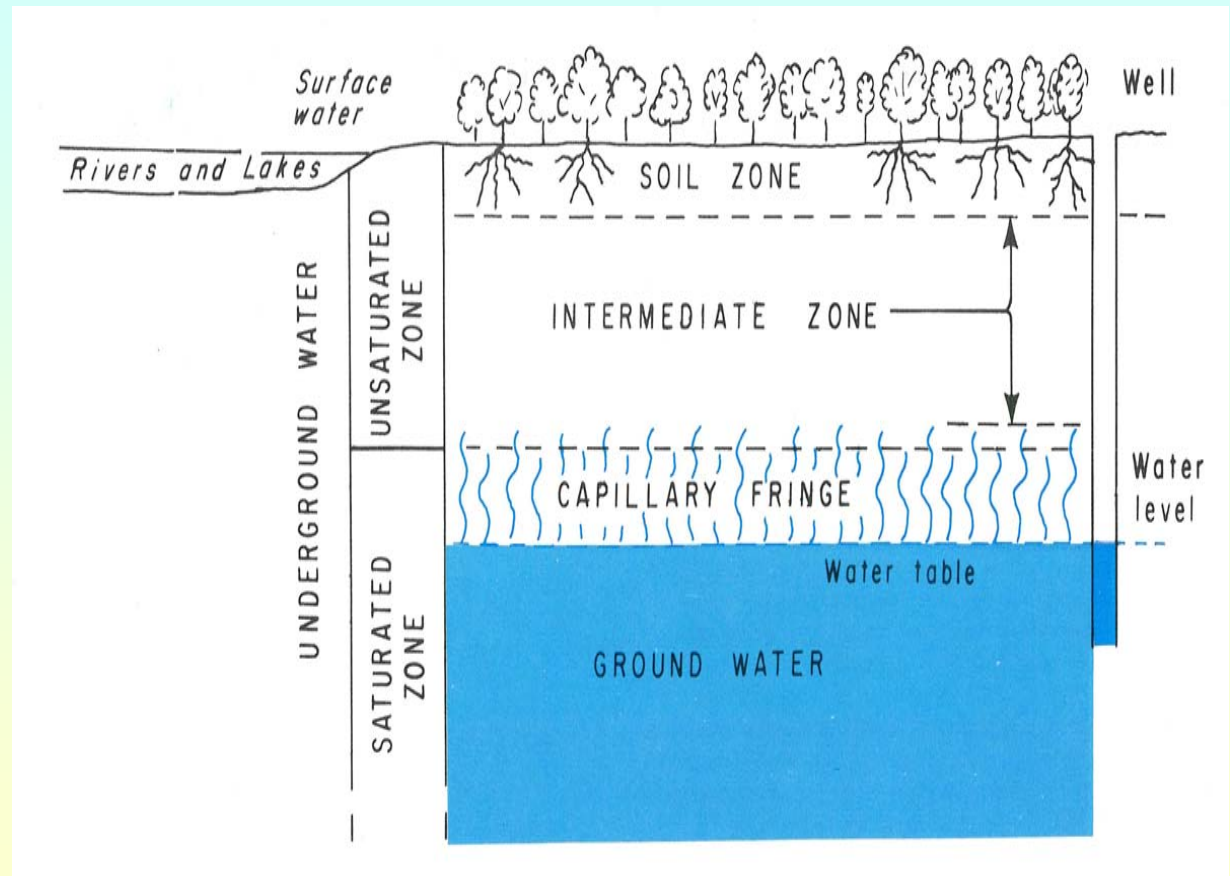
Ref: USGS, 1995



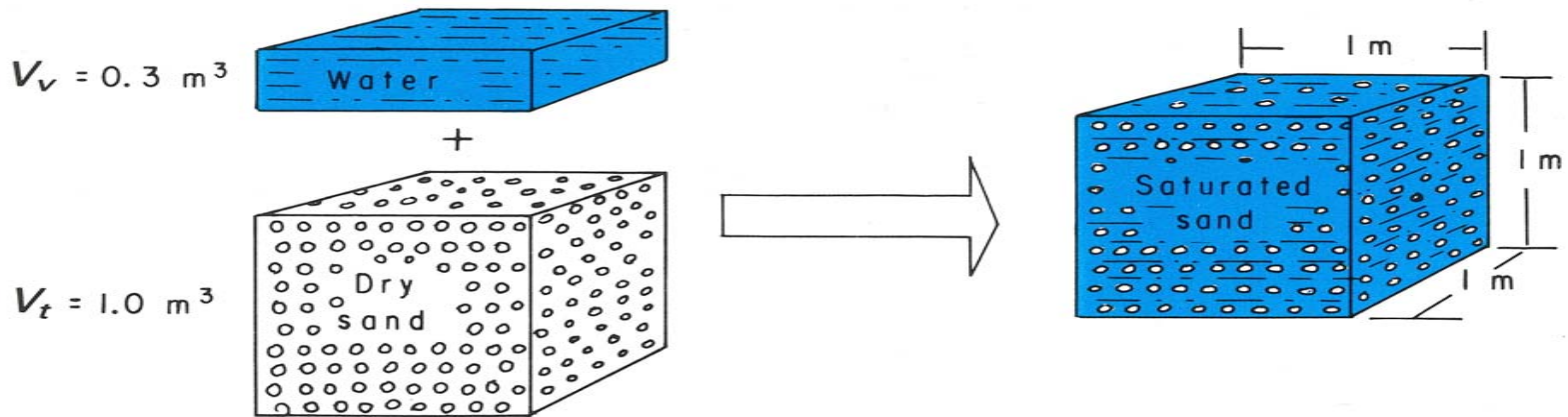
Groundwater

- Unsaturated Zone
- Capillary Fringe
- Saturated Zone
- Water Table
- Groundwater

Ref: USGS, 1995



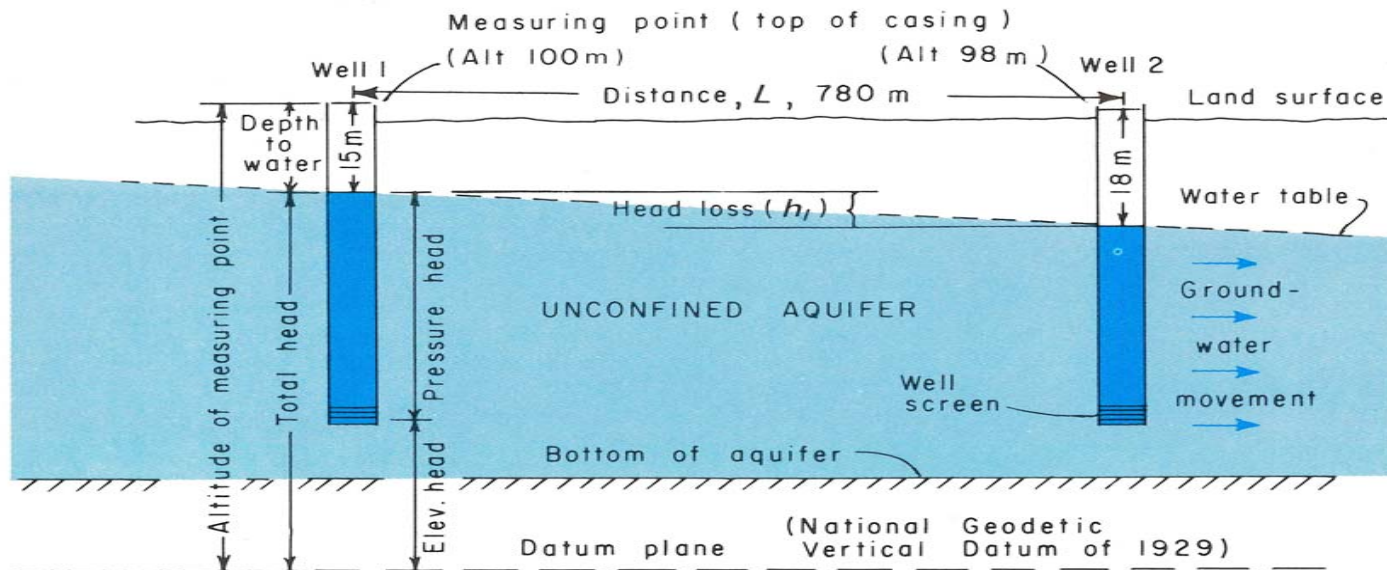
Porosity



$$\text{Porosity } (n) = \frac{\text{Volume of voids } (V_v)}{\text{Total volume } (V_t)} = \frac{0.3 \text{ m}^3}{1.0 \text{ m}^3} = 0.30$$

- Pore spaces: small voids between soil particles
- Porosity = ratio of void volume / total volume
 - Often expressed as a percentage (e.g., 25% porosity)

Hydraulic Gradient



- Groundwater moves from areas of higher elevation (head) to lower elevation (head), that is, downhill.
- Hydraulic gradient is the change in head per unit of distance in a given direction.
 - Typically expressed in ft/ft



Darcy's Law

- Henry Darcy, a French engineer, described aquifers as porous conduits (or pipes filled with sand).
- Performed experiments using a sand-filled pipe.
- In 1856 he expressed the factors controlling ground-water movement in the equation:

$$Q = KA(dh/dL)$$

Where:

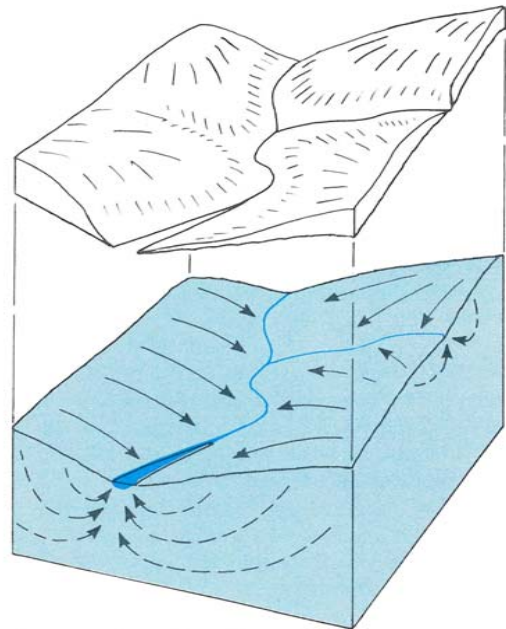
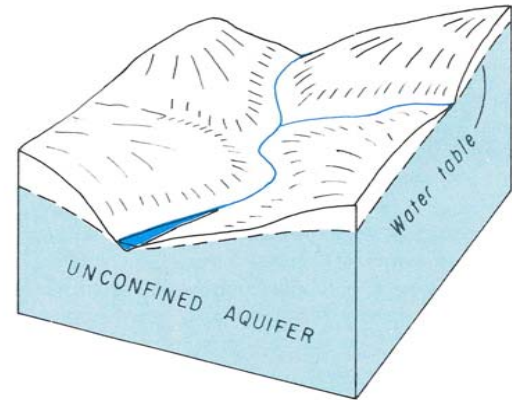
- Q = **discharge** (e.g., gallons per minute or ft³/day)
 - K = coefficient of **hydraulic conductivity** (e.g., ft/day)
 - A = cross sectional **area** (e.g., ft²)
 - dh/dL = **hydraulic gradient** (e.g., ft/ft)
- Darcy's Law is the basis for defining groundwater flow.

Ref: USGS, 1995

Groundwater Movement

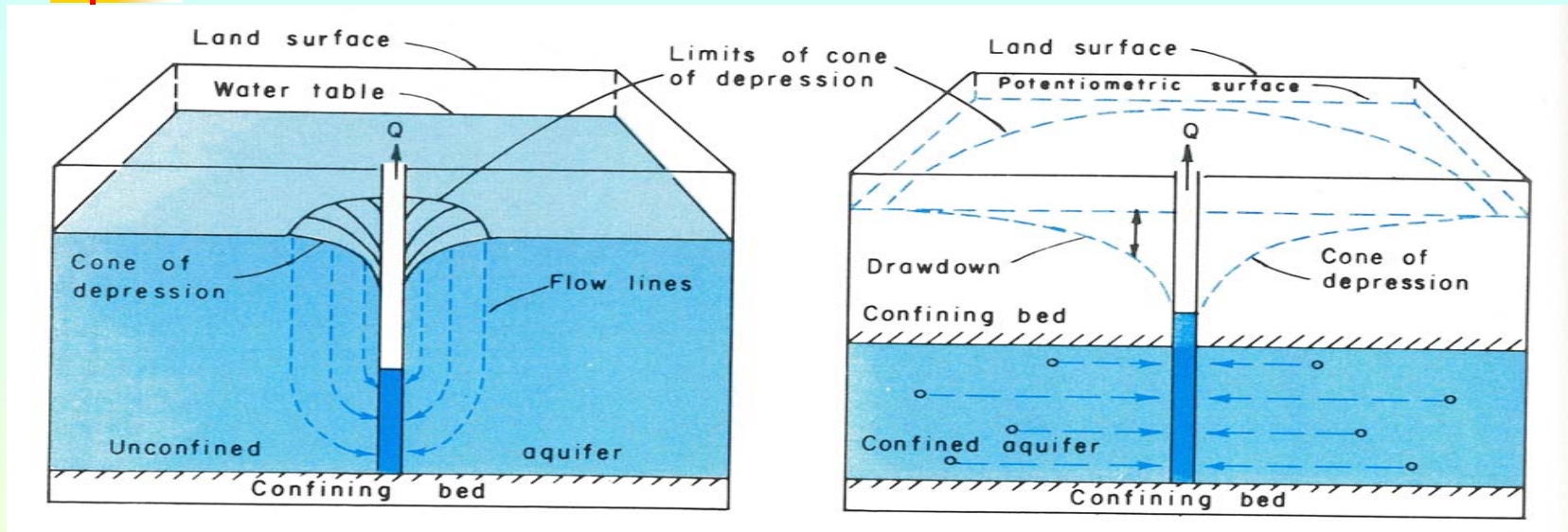
- Gravity is the dominant force
- Groundwater naturally moves downhill
- Groundwater moves from areas of recharge to areas of discharge
- Under natural conditions, the groundwater table tends to mimic the land surface

Ref: USGS, 1995



Arrows show direction of
ground-water movement

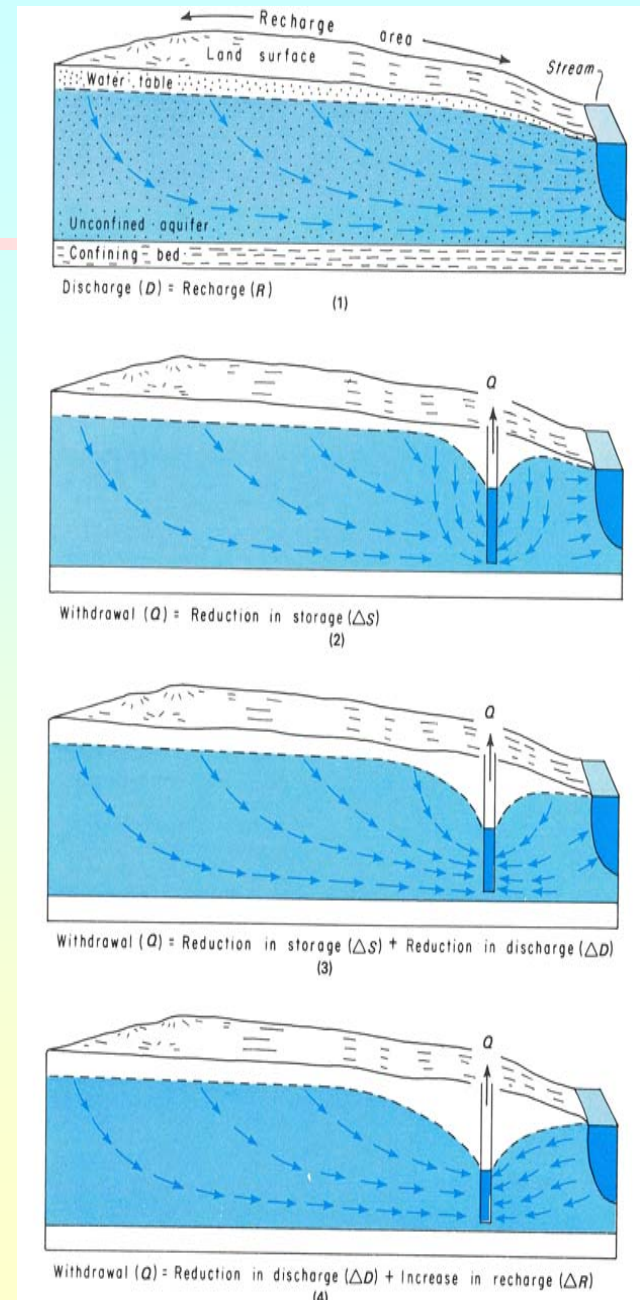
Cone of Depression



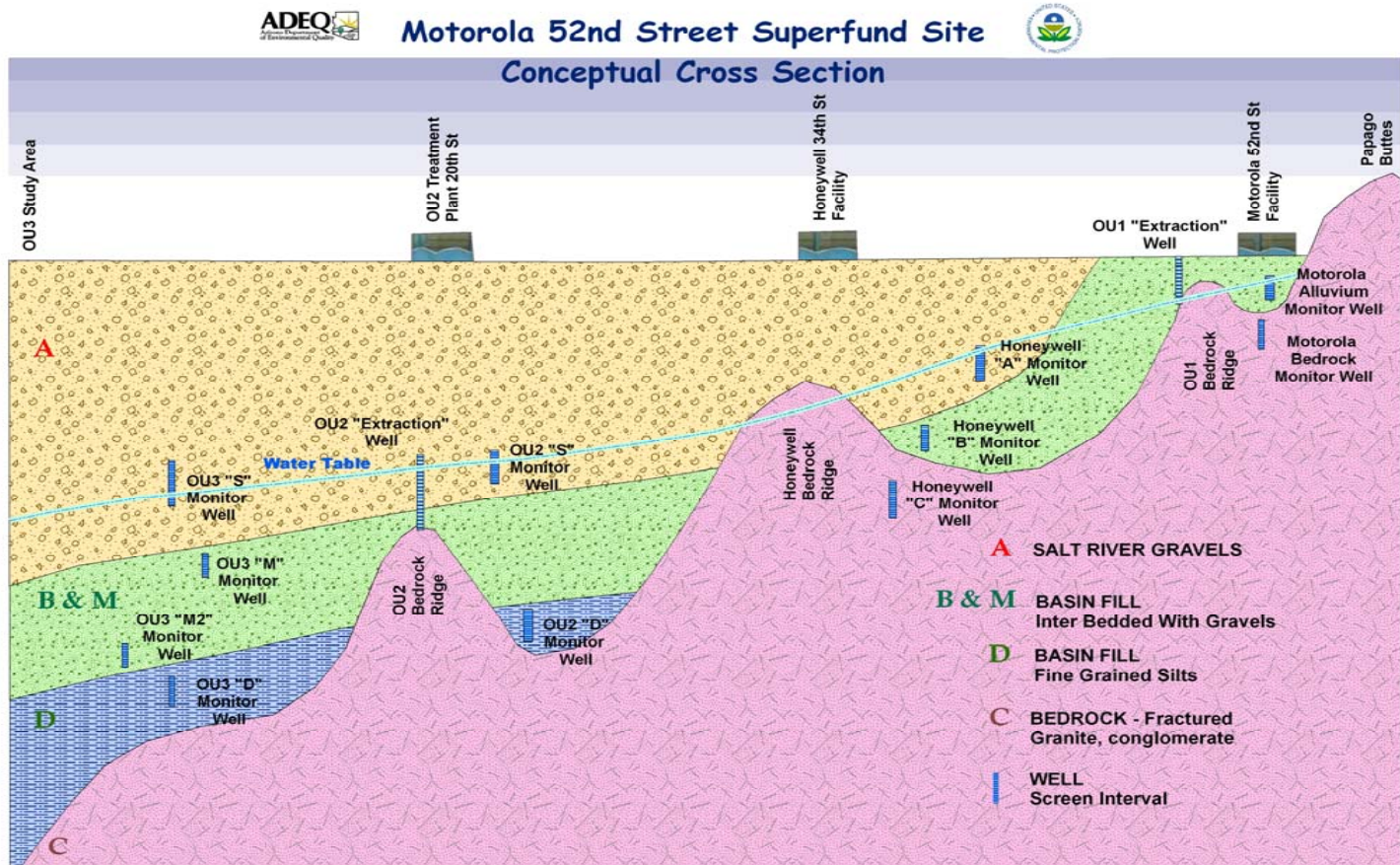
- When water is initially pumped from a well, the water level in the well begins to decline.
- As the water level in the well falls, water moves from the aquifer into the well.
- A cone of depression develops around the well.
- The cone of depression will continue to grow until the rate of flow into the well from the aquifer equals the rate of withdrawal from the well.

Cone of Depression and Source of Water to Wells

- Flow under natural conditions
- Reduction in Storage and expansion of cone of depression
- Reduction in storage and reduction in discharge to the stream
- System reaches equilibrium – the rate of withdrawal is balanced by a reduction in the rate of natural discharge.



Motorola 52nd Street Conceptual Site Model



Layer sequence determined by ADEQ

Kristina Paschall: Project Manager
David Haag: Project Hydrologist
TS Summers: GIS

Note: Drawing Not to Scale

Motorola 52nd Street Superfund Site

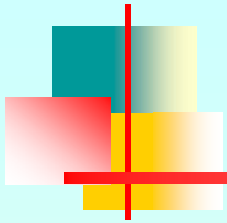
Community Advisory Group
Hydrogeology Presentation: Part 2
November 8, 2006



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HYDROGEOLOGY: PART 2

OVERVIEW

- Groundwater Elevation Contour Lines
- Groundwater Flow Lines
- Collection of Groundwater Data
- Interpretation of Groundwater Data

Contour Lines & Flow Lines

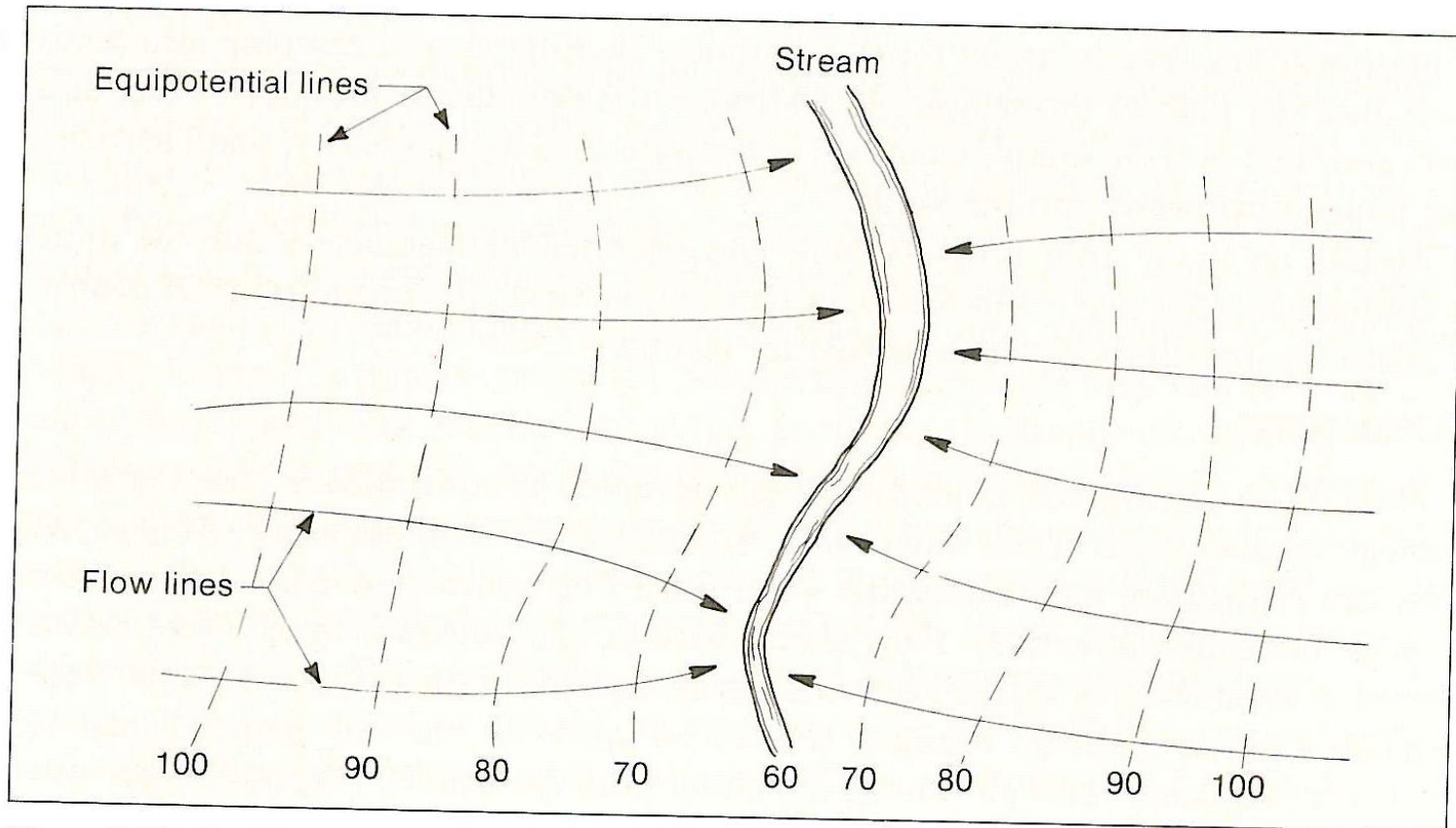
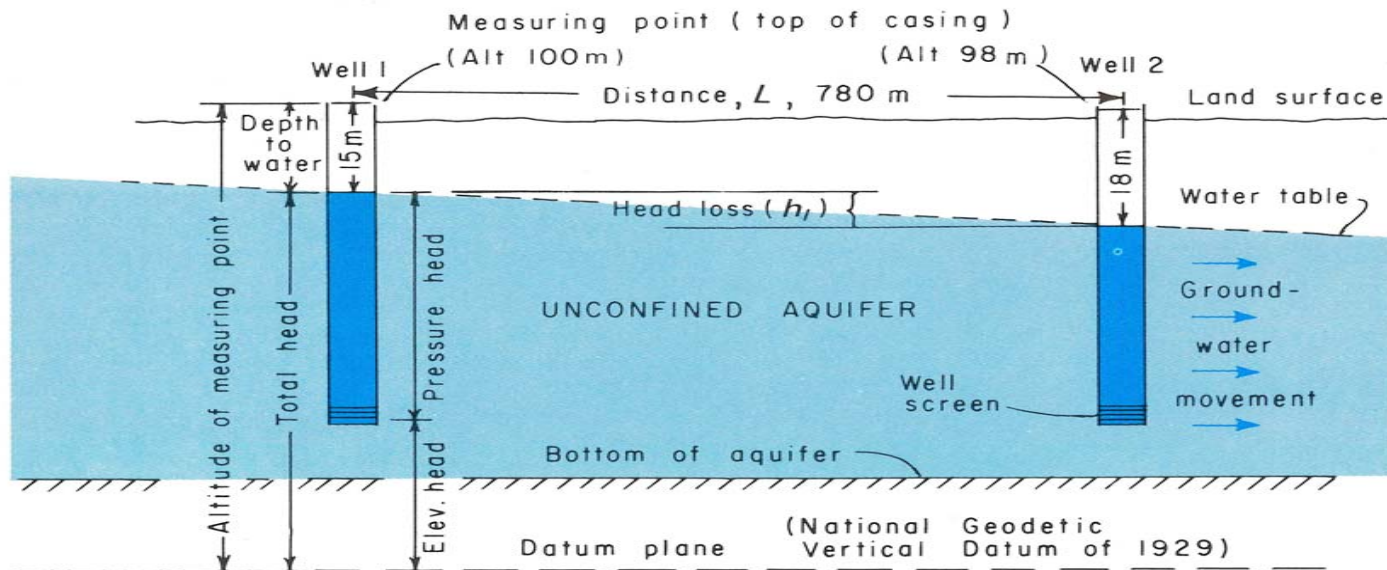


Figure 5.17b. Looking down on the stream valley from above with the water table exposed. The dotted lines represent points of equal groundwater elevation.

- Ref: Driscoll, 1986, Groundwater and Wells

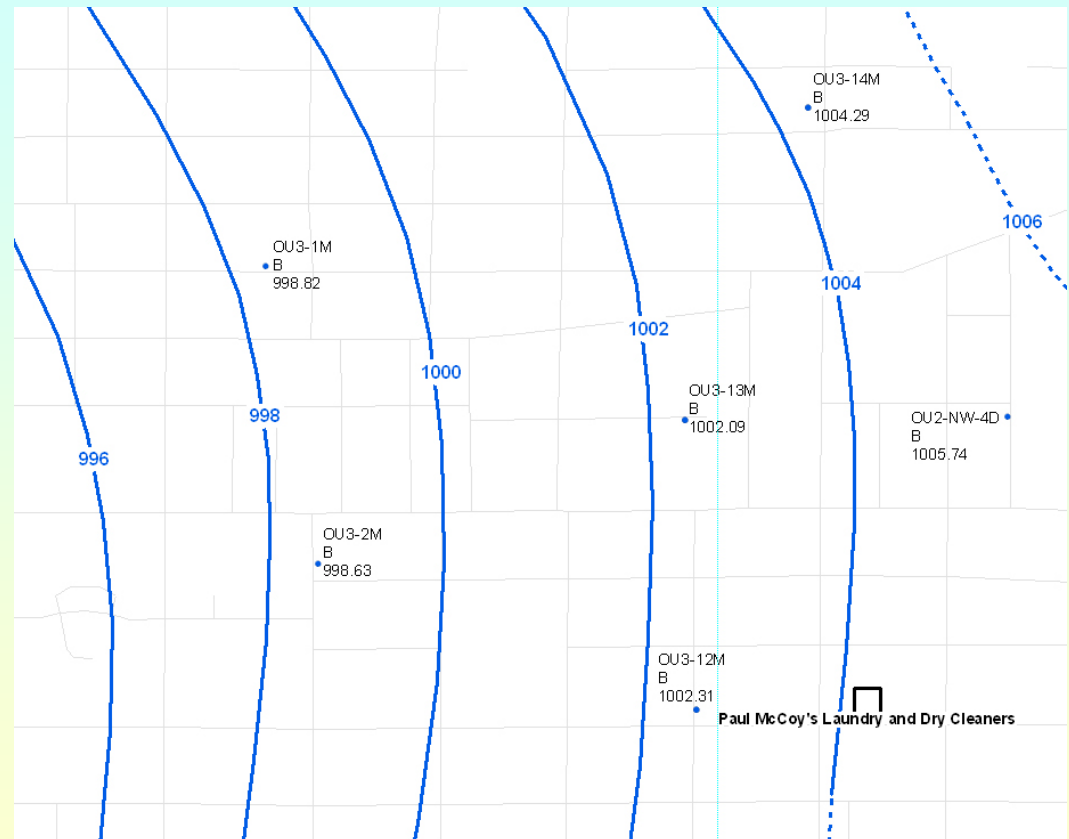
Groundwater Elevation Data



- Wells are surveyed (top of casing)
- Depth to groundwater is measured with an electronic sounder
- Accuracy is typically ± 0.01 ft
- Well elevation – depth to water = water table elevation

Groundwater Data Interpretation

- Calculated groundwater table elevation data are contoured:
 - Manual – analytical methods performed by trained geologists
 - Computer – groundwater elevation data are loaded into specialty software which employs analysis to generate contours



Ref: ADEQ, 2005, Site-wide Groundwater Elevation Contours, Subunit B

Motorola 52nd Street Superfund Site

Community Advisory Group

Five-Year Reviews
Operable Units 1 & 2:
November 8, 2006



AGENDA

- **Call to Order/Introductions**
- **Review of hydrogeologic concepts and Site geology (ADEQ/LFR)**
- **The Five-Year Review Process (ADEQ)**
- **Operable Unit One (OU1) – Five-Year Review (ADEQ/LFR)**
- **Operable Unit Two (OU2) – Five-Year Review (ADEQ/LFR)**
- **EPA/ADEQ Announcements**
- **Call to Public**
- **Future Meeting Plans/Agenda Discussion**
- **Adjournment**

CALL TO ORDER & INTRODUCTIONS

➤ **ADEQ Project Staff**

- Kris Paschall, ADEQ Remedial Project Manager
- David Haag, ADEQ Project Hydrologist
- Linda Mariner, ADEQ Community Involvement Coordinator

➤ **EPA Project Staff**

- Janet Rosati, EPA Remedial Project Manager (OU3 Groundwater Activities)
- Leah Butler, EPA Remedial Project Manager
- Viola Cooper, EPA Community Involvement Coordinator

➤ **CAG Members**

➤ **Community Members & Interested Parties**

REVIEW OF HYDROGEOLOGIC CONCEPTS AND SITE GEOLOGY (ADEQ/LFR)

OU1 AND OU2 FIVE-YEAR REVIEWS

FIVE-YEAR REVIEW: PRESENTATION OVERVIEW

- MOTOROLA 52ND STREET OVERVIEW
- WHY THE FIVE-YEAR REVIEW?
- THE FIVE-YEAR REVIEW PROCESS
- OU1 FIVE-YEAR REVIEW
 - BACKGROUND
 - TECHNICAL ASSESSMENT
 - ISSUES
 - FOLLOW-UP ACTIONS
- OU2 FIVE-YEAR REVIEW
 - BACKGROUND
 - TECHNICAL ASSESSMENT
 - ISSUES
 - FOLLOW-UP ACTIONS

MOTOROLA 52ND STREET: OVERVIEW

➤ Agency Roles

- Site-wide Oversight – ADEQ
- Former Motorola Facility/OU1 Oversight – ADEQ
- Honeywell 34th Street Facility Oversight – ADEQ
- OU2 Interim Groundwater Remedy Oversight – EPA / ADEQ
- OU3 Groundwater Investigation – EPA
- OU2 Potentially Responsible Parties Oversight – ADEQ
- OU3 Potentially Responsible Parties Oversight – EPA

WHY THE FIVE-YEAR REVIEW?

It's Required:

- CERCLA §121(c)
 - (Comprehensive Environmental Response, Compensation, and Liability Act)
- NCP 40 CFR §300.430(f)
 - (National Contingency Plan)

WHY THE FIVE YEAR REVIEW?

- Two conditions must be met:
 - The remedy was selected under CERCLA § 121
 - Once the remedy is in place and there are hazardous substances, pollutants, or contaminants remaining at the site

- OU1 and OU2 Interim Remedies meet these requirements

PURPOSE OF THE FIVE YEAR REVIEW

➤ To Determine Protectiveness:

The purpose of the five-year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is or will be protective of human health and the environment.

➤ 3 questions are used to determine whether a remedy is protective:

- *Question A: Is the remedy functioning as intended by the decision documents?*
- *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*
- *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

WHEN IS A FIVE YEAR REVIEW IS TRIGGERED?

- The Five-Year Review is triggered by the initiation of the first remedial action
- OU1 First Five-Year Review conducted in 1995
 - Second Five-Year Review conducted in 2001 (one year late)
 - Third Five-Year Review conducted in 2006
- OU2 First Five-Year Review was initiated by the OU1 Second Five-Year Review
 - First Five-Year Review conducted in 2001
 - Second Five-Year Review conducted in 2006

FIVE-YEAR REVIEW PROCESS

- Administrative components
 - Five-year review team
- Community Involvement
 - Issue Public Notice (April 2006)
- Document review
- Data review and evaluation
- Interviews
- Site Inspection

FIVE-YEAR REVIEW PROCESS

- All of the information gathered from the five-year review process is used to perform a technical assessment of the remedy.
- Based on the technical assessment, the following are identified:
 - Issues or noted concerns
 - Recommendations and follow-up actions
 - Protectiveness Statement

OU1



OU1 FIVE-YEAR REVIEW

- BACKGROUND
- TECHNICAL ASSESSMENT
- ISSUES
- FOLLOW-UP ACTIONS
- PROTECTIVENESS STATEMENT

OU1: BACKGROUND

- 1956 – Manufacturing operations began at the Motorola 52nd Street Facility
 - Semiconductor Manufacturer
- 1963 to 1974 – Dry well located in Courtyard area used for solvent disposal
 - Approximately 93,000 gallons of TCE disposed in dry well
- 1974 to 1976 – Southwest Parking Lot (SWPL) area used for waste chemical storage
- November 1982 – Discovered inventory discrepancy from TCA UST
- January 1983 – Notified ADHS of leaking UST
- February 1983 to June 1987 – Remedial Investigation

OU1: BACKGROUND

- June 1988 – Freescale prepared a Remedial Action Plan (RAP)
 - Interim Remedial Action selected
 - On-site and off-site extraction wells
 - On-site SVE
 - On-site groundwater treatment plant
- September 1988 – EPA issued Record of Decision (ROD); ADEQ issued Letter of Determination (LOD) for OU1
 - Provided EPA's and ADEQ's approval of the RAP
 - Outlined the remedies for OU1
- June 20, 1989 - Consent Order (CO) issued
 - Design, construct, implement, and maintain a groundwater extraction, conveyance, and treatment system
 - Design, construct, and operate three SVE systems on-site.
- October 1989 – Site was placed on the EPA CERCLA National Priorities List (NPL)

OU1: BACKGROUND

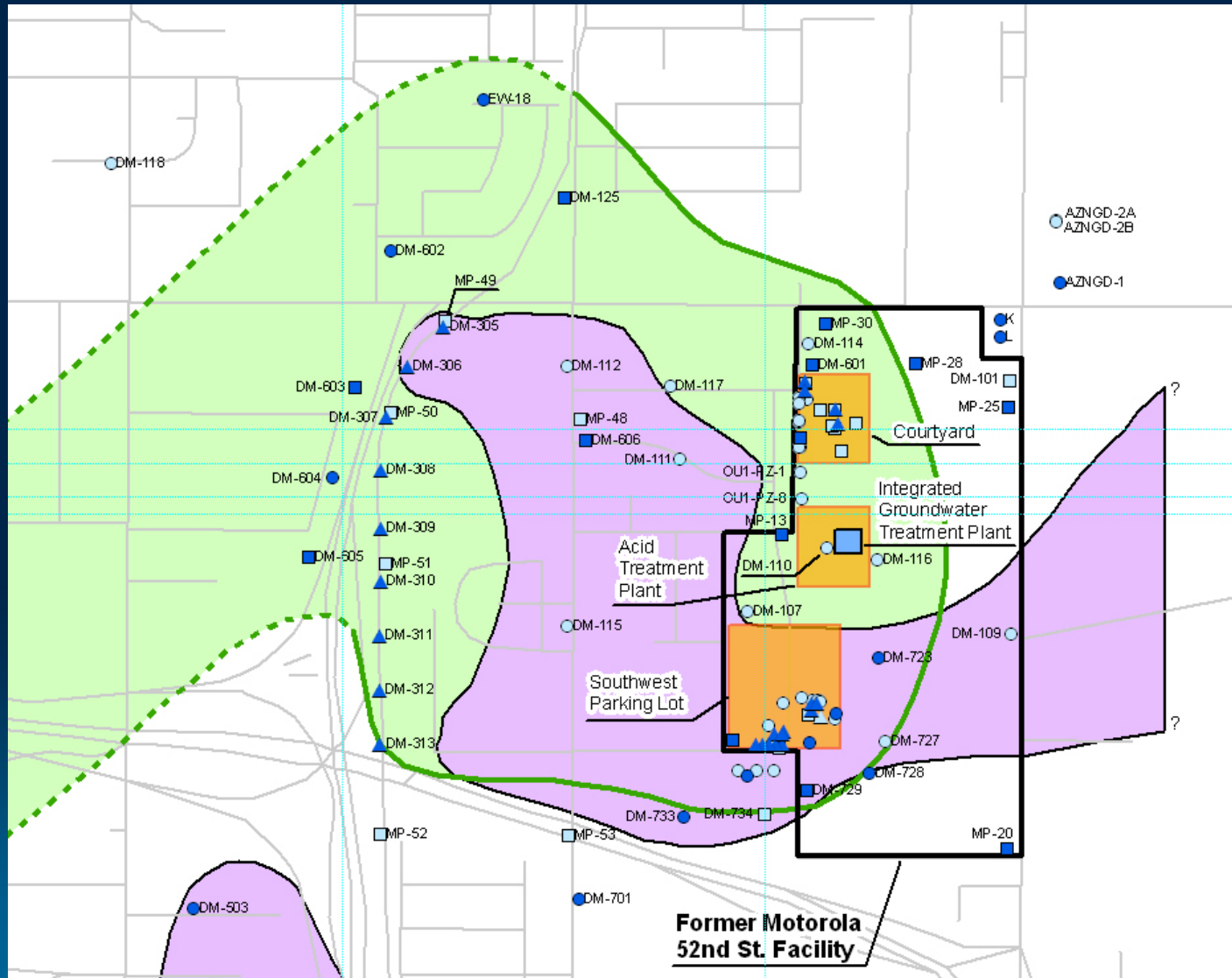
- July 1992 – Integrated Groundwater Treatment Plant (IGWTP) operational
- September 1992 to March 1993 – Courtyard SVE operational
- November 1996 to April 1997 – SWPL SVE/AS operational
- November 2002 – ADEQ issues NFA for SWPL soils
- September 2005 – Freescale submitted Groundwater Remedial Alternatives Analysis report (Feasibility Study update)
- December 2005 - Freescale submitted an Addendum to the Groundwater Remedial Alternatives Analysis report (Feasibility Study update)

OU1: BACKGROUND

➤ OU1 Design:

- Groundwater Pump and Treat
- 16 On-site groundwater extraction wells
- 9 Off-site groundwater extraction wells
- 3 capture zones
- Treatment Plant at former 52nd Street facility
- Treated water used at ON Semiconductor facility
- Soil Vapor Extraction (SVE) at Courtyard and Southwest Parking Lot (SWPL) areas: currently not in use

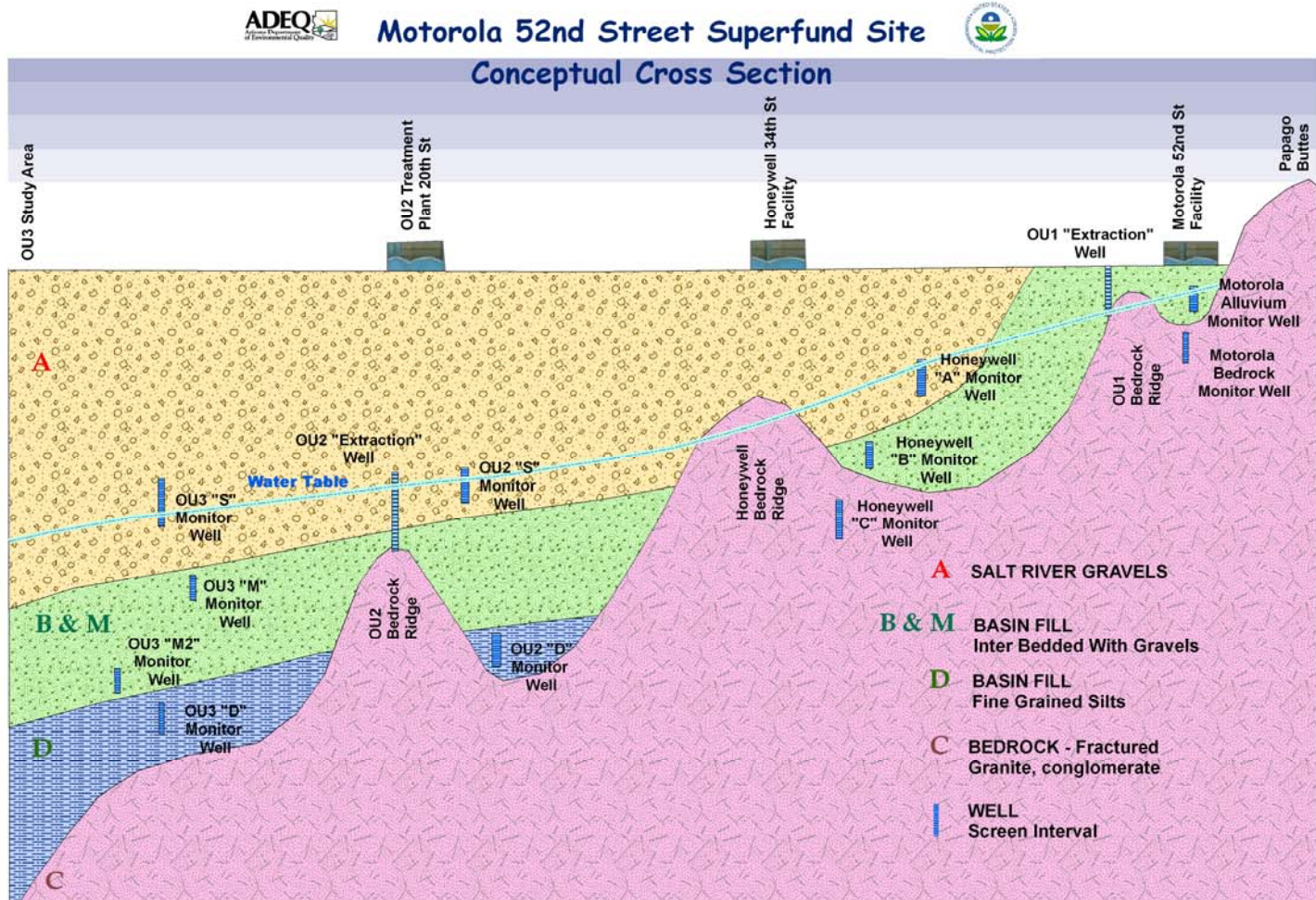
OU1: SYSTEM COMPONENTS



OU1: TECHNICAL ASSESSMENT

- Review Conceptual Site Model (CSM)
- Define capture zone (remedial objectives)
- Interpret groundwater elevations
- Perform calculations (if complex site)
- Evaluate concentration trends
- Interpret capture

OU1: CONCEPTUAL SITE MODEL



Layer sequence determined by ADEQ

Kristina Paschall: Project Manager
David Haag: Project Hydrologist
TS Summers: GIS

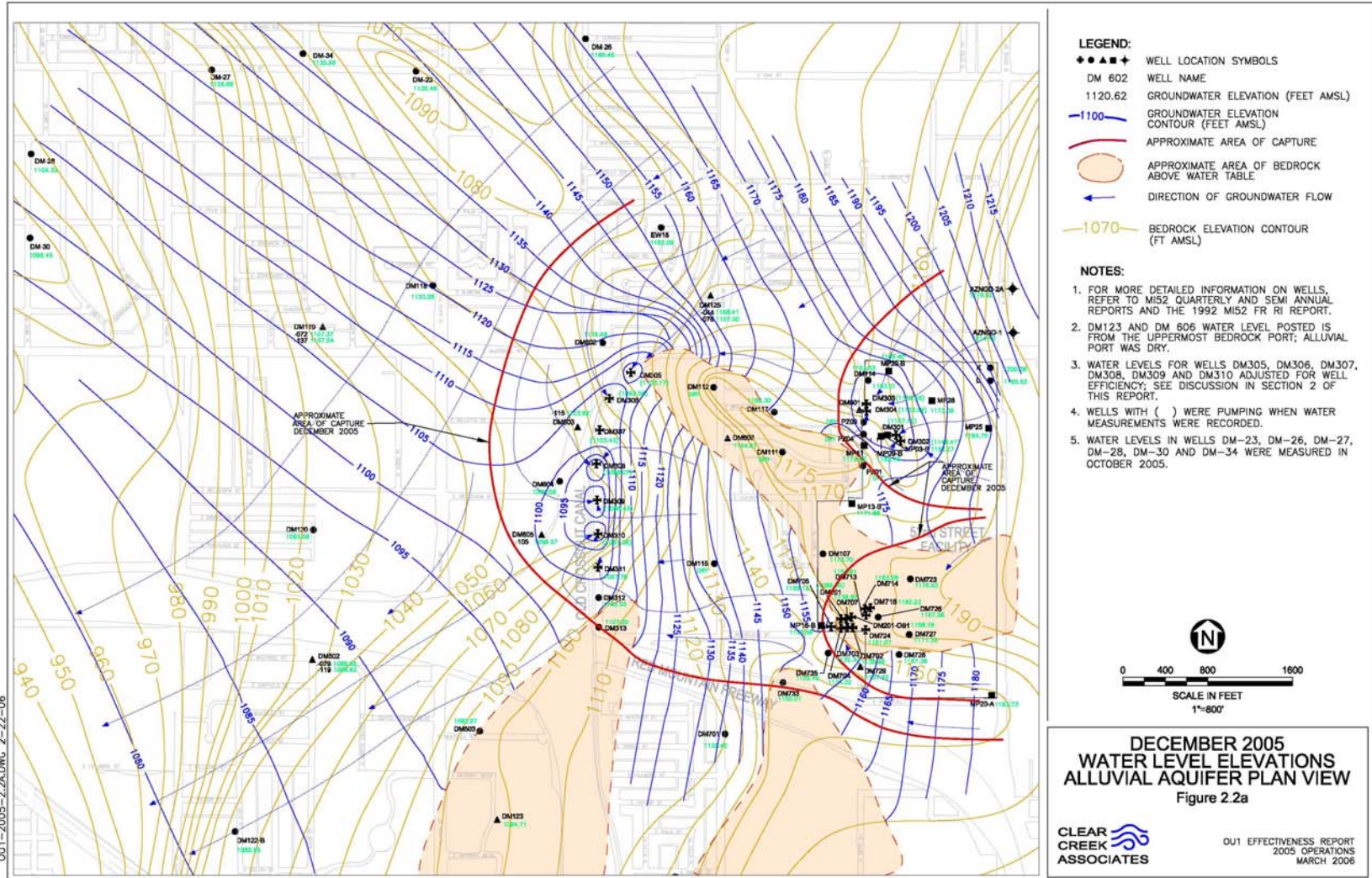
Note: Drawing Not to Scale

OU1: REMEDIAL OBJECTIVES

- Soil vapor extraction in identified source areas to remove VOCs in the unsaturated soils to levels agreed upon by ADEQ;
- Establish a zone of capture at the Old Crosscut Canal to hydraulically contain groundwater contamination. The system should also have a beneficial impact on groundwater quality within bedrock;
- Source area (on-site) groundwater extraction to reduce or eliminate contaminant migration;
- End use of all extracted groundwater at the former Motorola 52nd Street Facility (now ON Semiconductor);
- Treatment of extracted groundwater to meet federal, state, and local standards for the designated end-use.

OU1: REVIEW GROUNDWATER DATA

➤ Data gaps

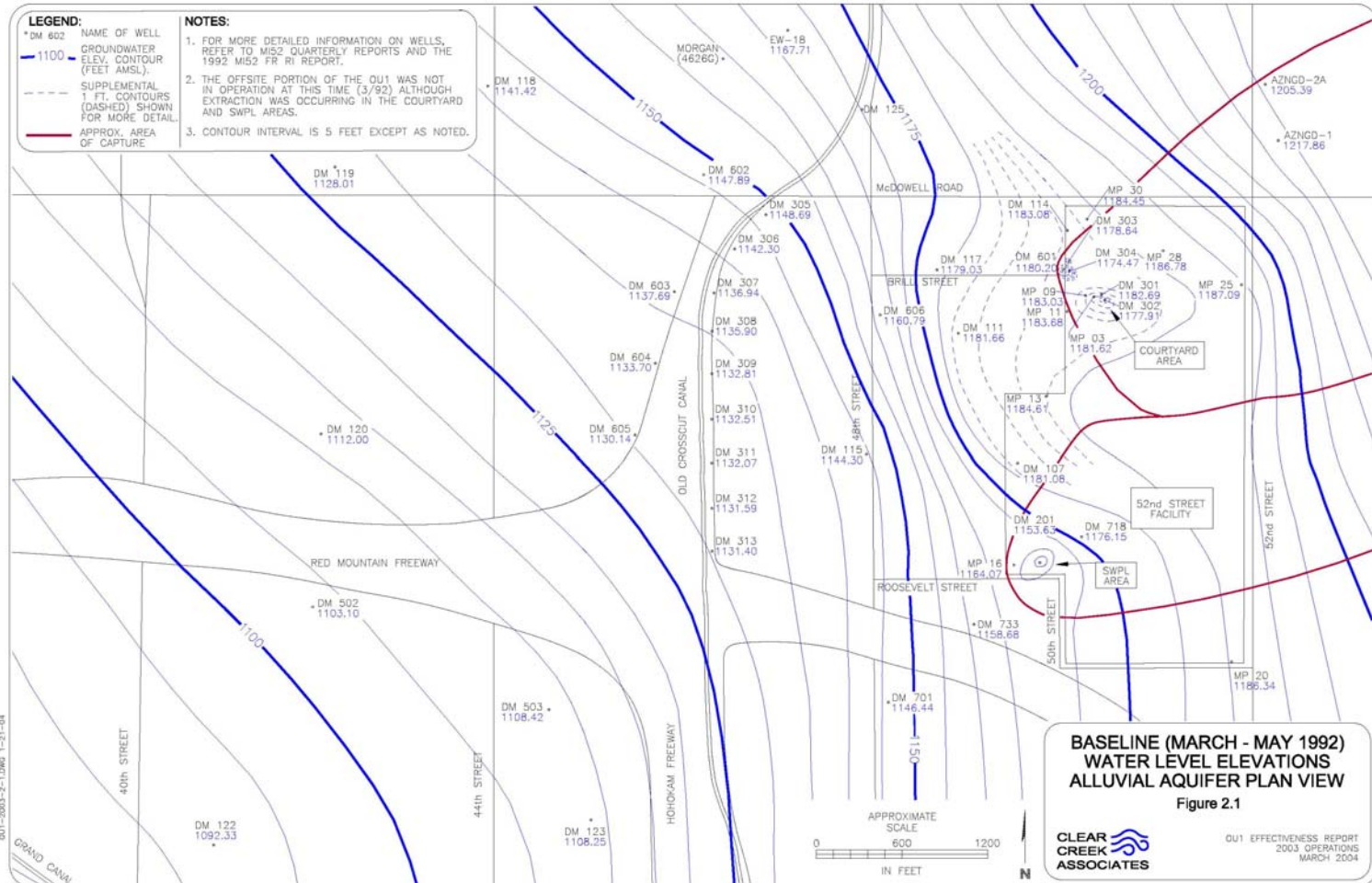


➤ Data gaps



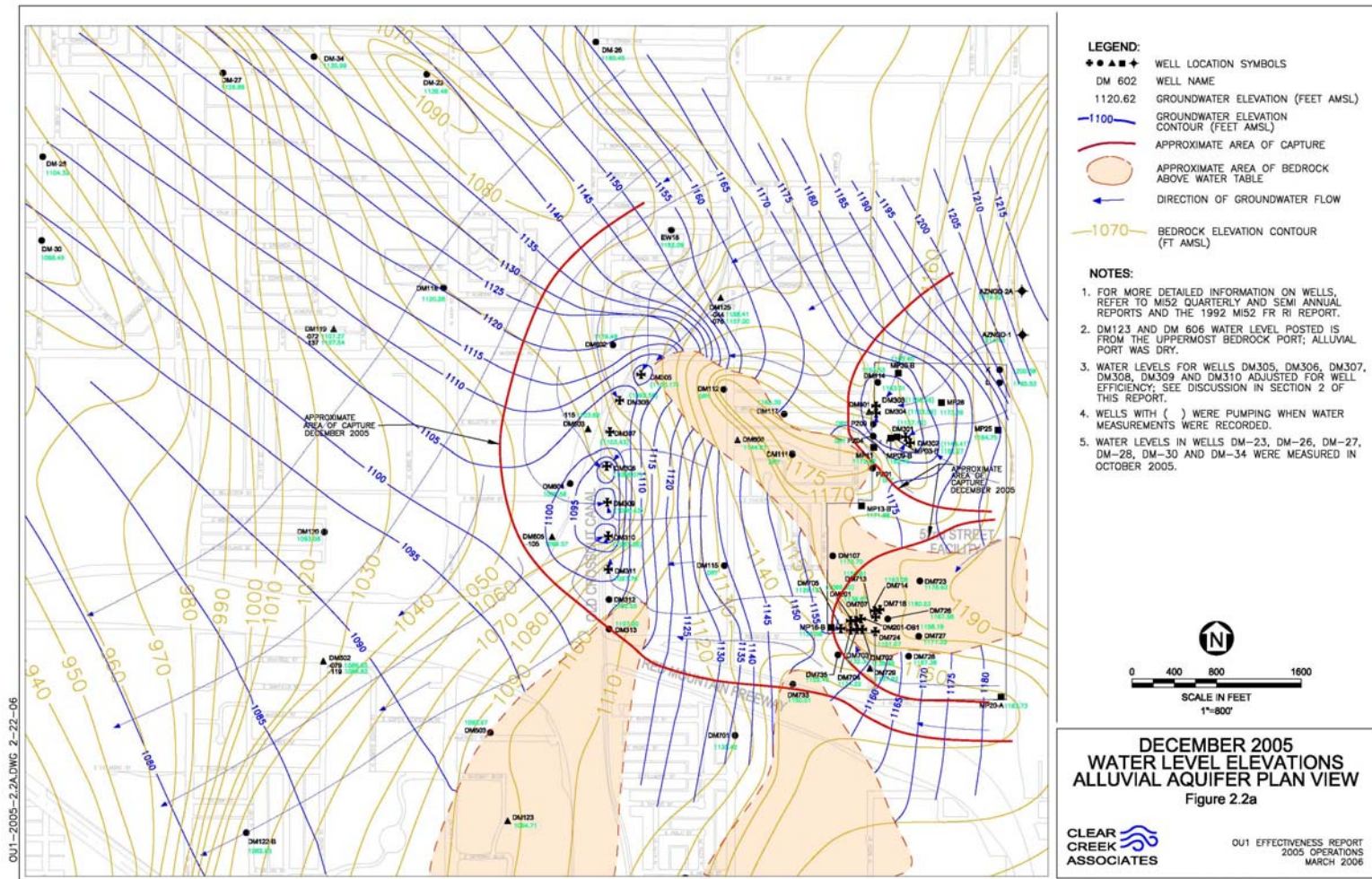
OU1: REVIEW GROUNDWATER DATA

➤ Groundwater levels 1992 - declining



OU1: REVIEW GROUNDWATER DATA

➤ Groundwater levels 2005 - declining



OU1: ISSUES

- Data gaps
- Bedrock capture
- Alluvial capture (at EW-18)
- Long-term effectiveness
- DNAPL remediation
- Soil closure (Courtyard and ATP)
- Indoor air risk evaluation
- Existing private and potential for new wells

OU1: FOLLOW-UP ACTIONS

- Work Plan to address data gaps
- Work Plan to study bedrock capture
- OU1 Feasibility Study Update
 - Address long-term effectiveness
 - Address DNAPL remediation
- Work Plan to address soil closure (Courtyard and ATP)
- ADEQ and EPA are currently developing methodology to evaluate indoor air risk
- ADEQ will request land owners to notify the department of private wells in the area (ADEQ will issue a fact sheet)

OU1: PROTECTIVENESS STATEMENT

- *A protectiveness determination of the OU1 interim remedy cannot be made at this time until further information is obtained. The necessary follow-up actions and recommendations identified in this Report are needed to evaluate protectiveness. The actions will require the efforts of Freescale and ADEQ to be completed. It is expected that these actions will take approximately 1 year to complete at which time a protectiveness determination will be made.*

OU2



OU2 FIVE YEAR REVIEW

- BACKGROUND
- TECHNICAL ASSESSMENT
- ISSUES
- FOLLOW-UP ACTIONS
- PROTECTIVENESS STATEMENT

OU2: BACKGROUND

- 1983 - Contamination discovered in OU2
- 1987 - East Washington Site listed on WQARF Priority List
- East Washington WQARF Site encompassed OU2 and OU3
- 1988 - ADEQ issued Information Requests to 995 facilities
- Late 1980s - ADEQ installed a series of monitor wells
- 1992 – Motorola (now Freescale) submitted the OU2 RI
- 1992 - EPA issued General Notice Letters to AlliedSignal (now Honeywell) and others

OU2: BACKGROUND

- 1993 – Motorola (now Freescale) submitted the OU2 Feasibility Study
- 1997 - ADEQ and EPA incorporated the East Washington WQARF site into the Motorola 52nd Federal Superfund Site
- 1998 - EPA issued a Unilateral Administrative Order to Freescale and Honeywell (the Companies) to:
 - **Construct, operate, and maintain the OU2 interim remedy**
- 1999 - Motorola completed the OU2 design
- 2001 - OU2 interim groundwater remedy constructed and operational

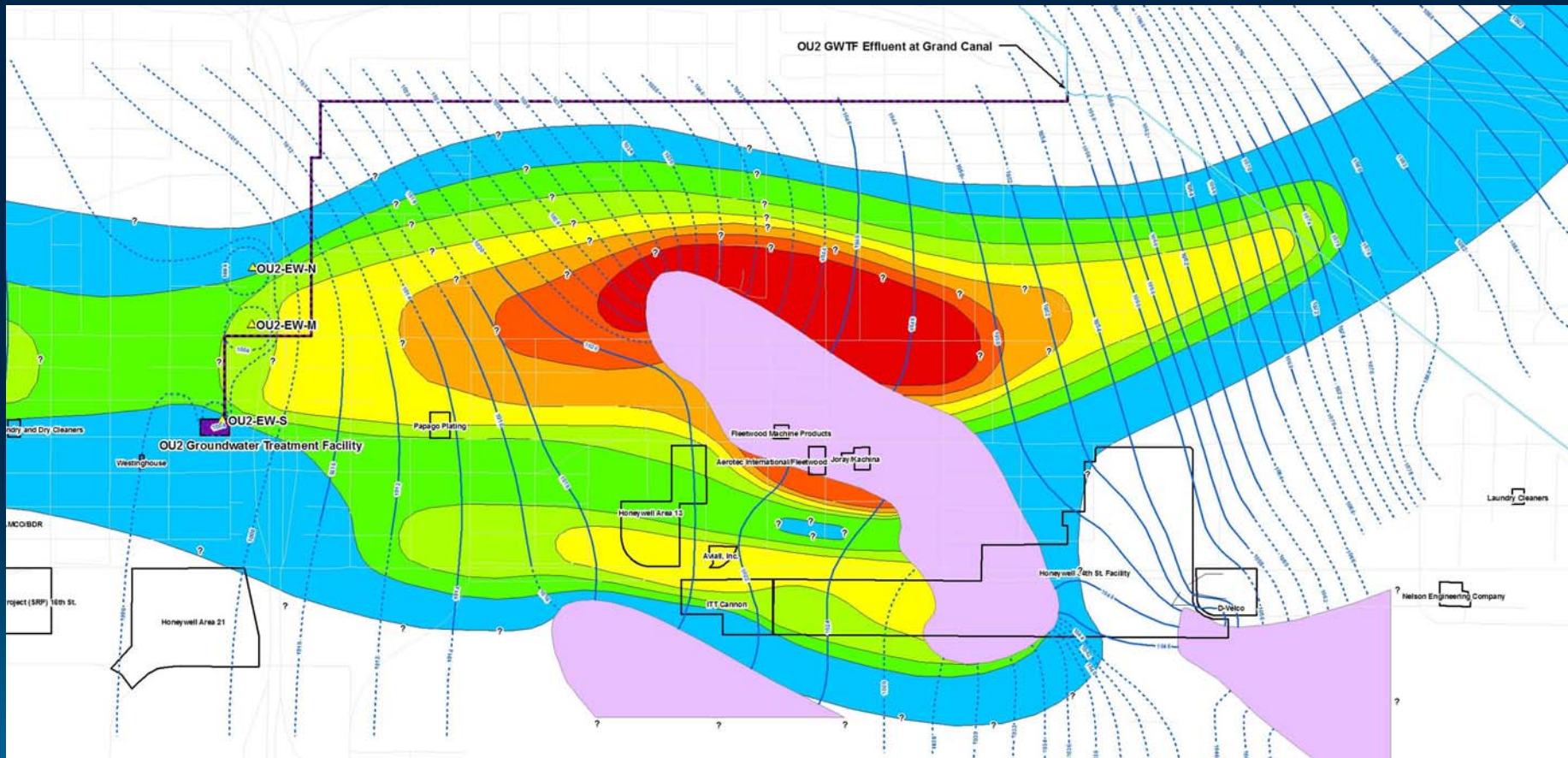
OU2: BACKGROUND

➤ OU2 Design:

- Groundwater Pump and Treat
- Three groundwater extraction wells
 - EW-N
 - EW-M
 - EW-S
- Treatment Plant at 20th Street
- Underground effluent pipeline to Grand Canal

OU2: SYSTEM COMPONENTS

- September 2005 TCE Concentrations in subunit B groundwater



OU2: SYSTEM COMPONENTS

➤ Discharge Point

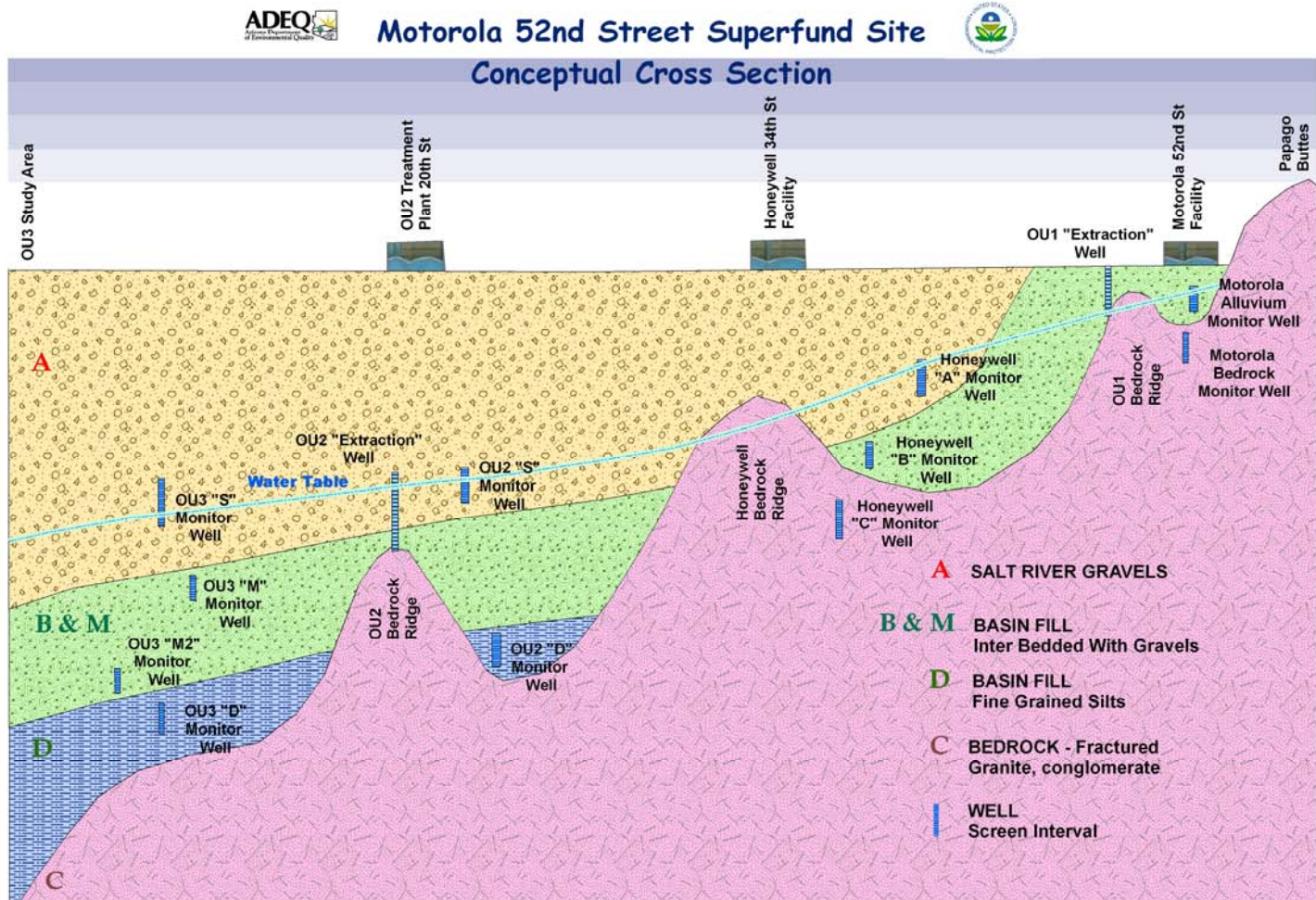
- Grand Canal



OU2: TECHNICAL ASSESSMENT

- Review Conceptual Site Model (CSM)
- Define capture zone (remedial objectives)
- Interpret groundwater elevations
- Perform calculations (if complex site)
- Evaluate concentration trends
- Interpret capture

OU2: CSM



Layer sequence determined by ADEQ

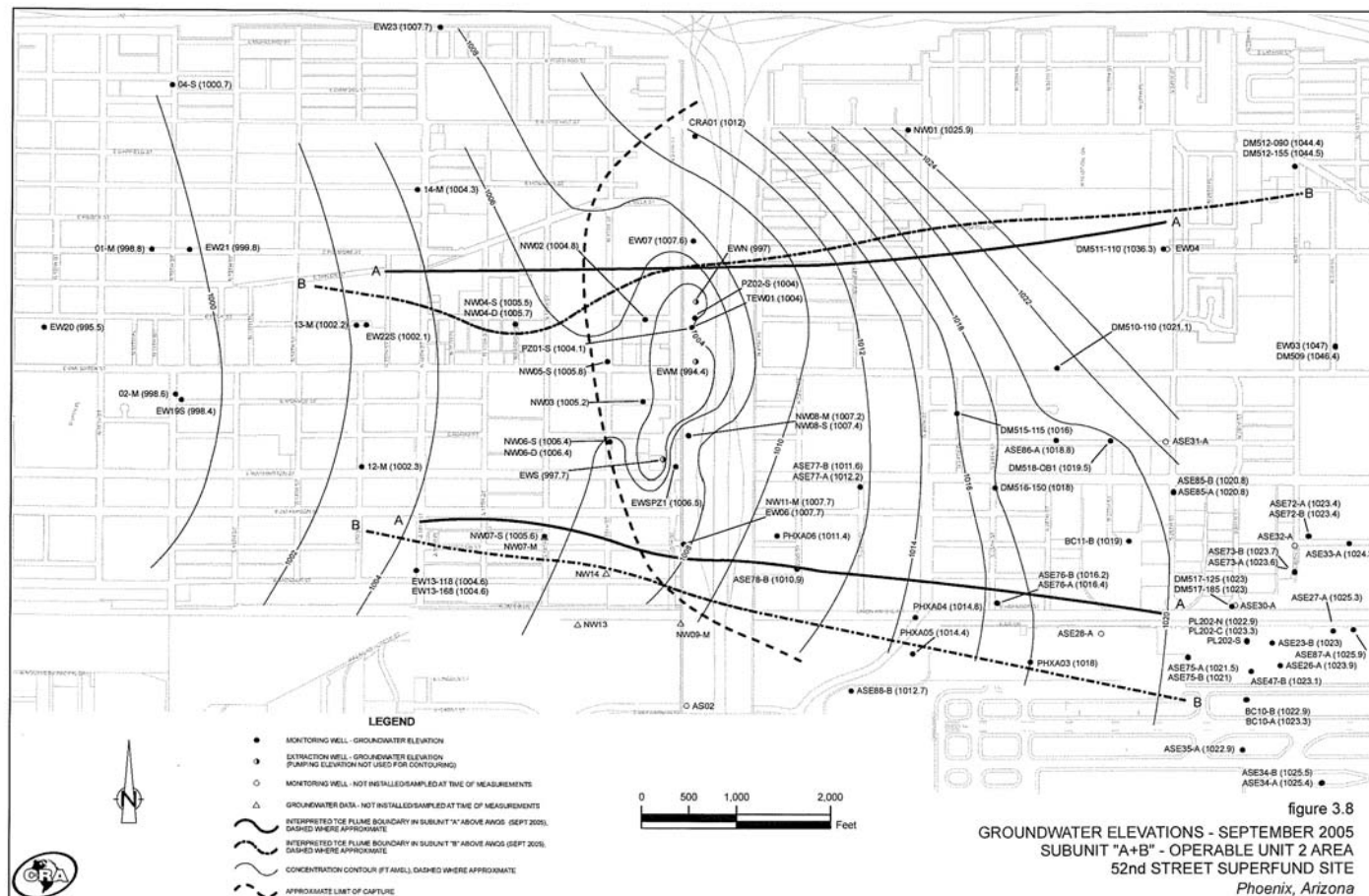
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Note: Drawing Not to Scale

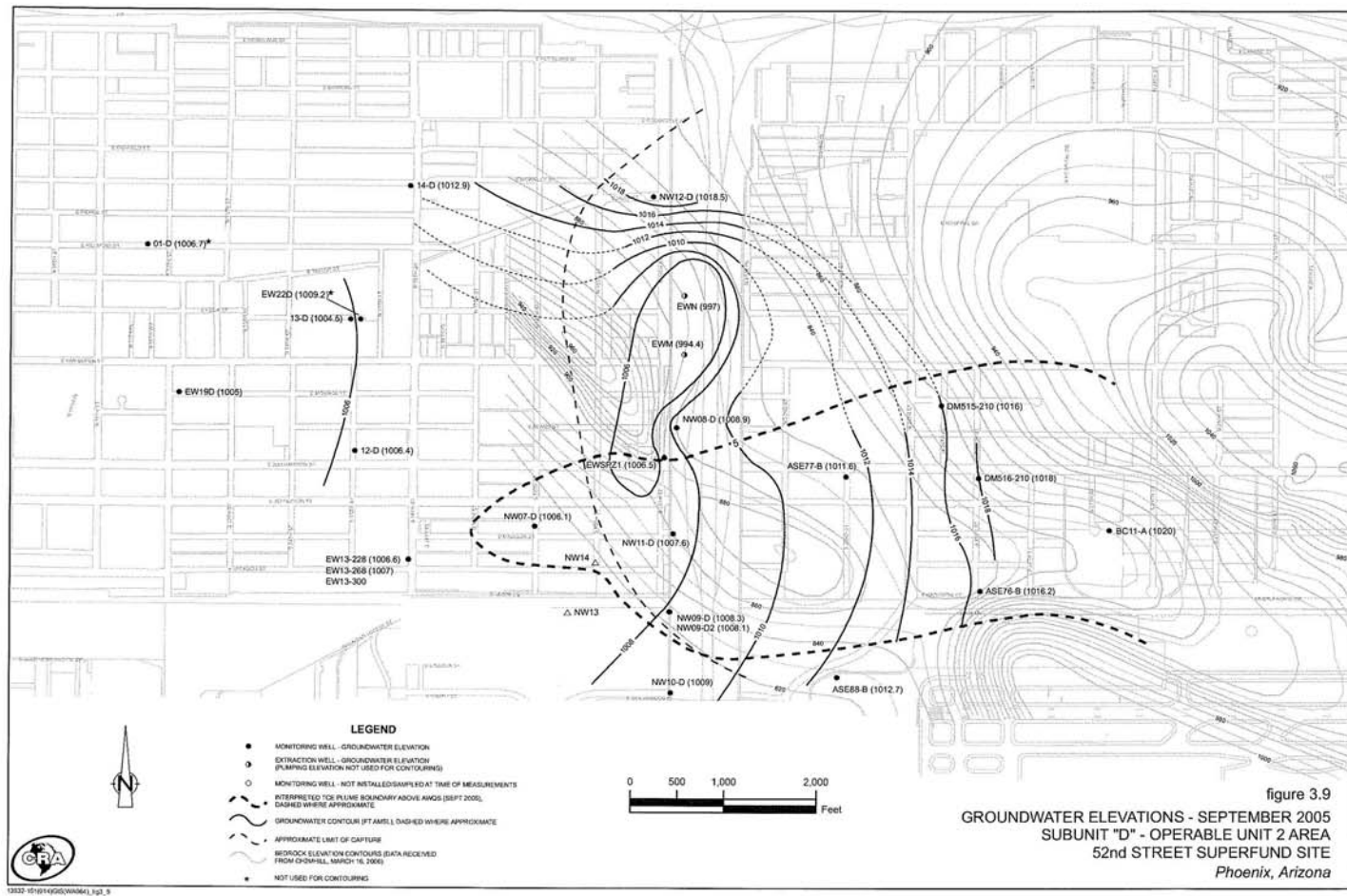
OU2: REMEDIAL OBJECTIVES

- Establish and maintain a capture zone across the entire width and depth of the contaminant plume near Interstate 10 and Van Buren Street;
- Remove and permanently destroy groundwater contamination above drinking water standards; and
- Discharge treated water to the SRP Grand Canal to be used for agricultural irrigation and agricultural livestock.

OU2: REVIEW GROUNDWATER DATA

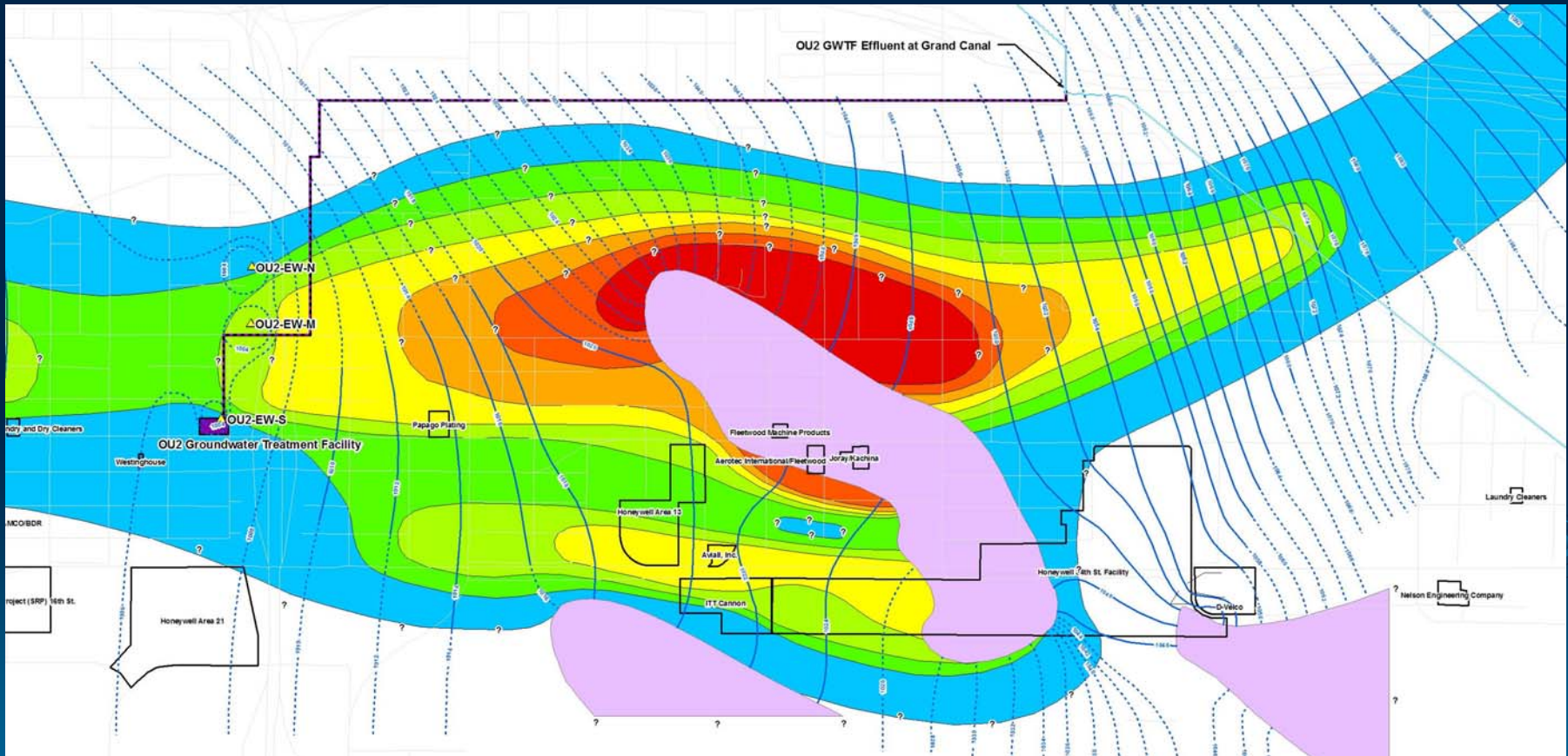


OU2: REVIEW GROUNDWATER DATA



OU2: REVIEW GROUNDWATER DATA

- Future issue: stagnation zones at Honeywell Bedrock Ridge

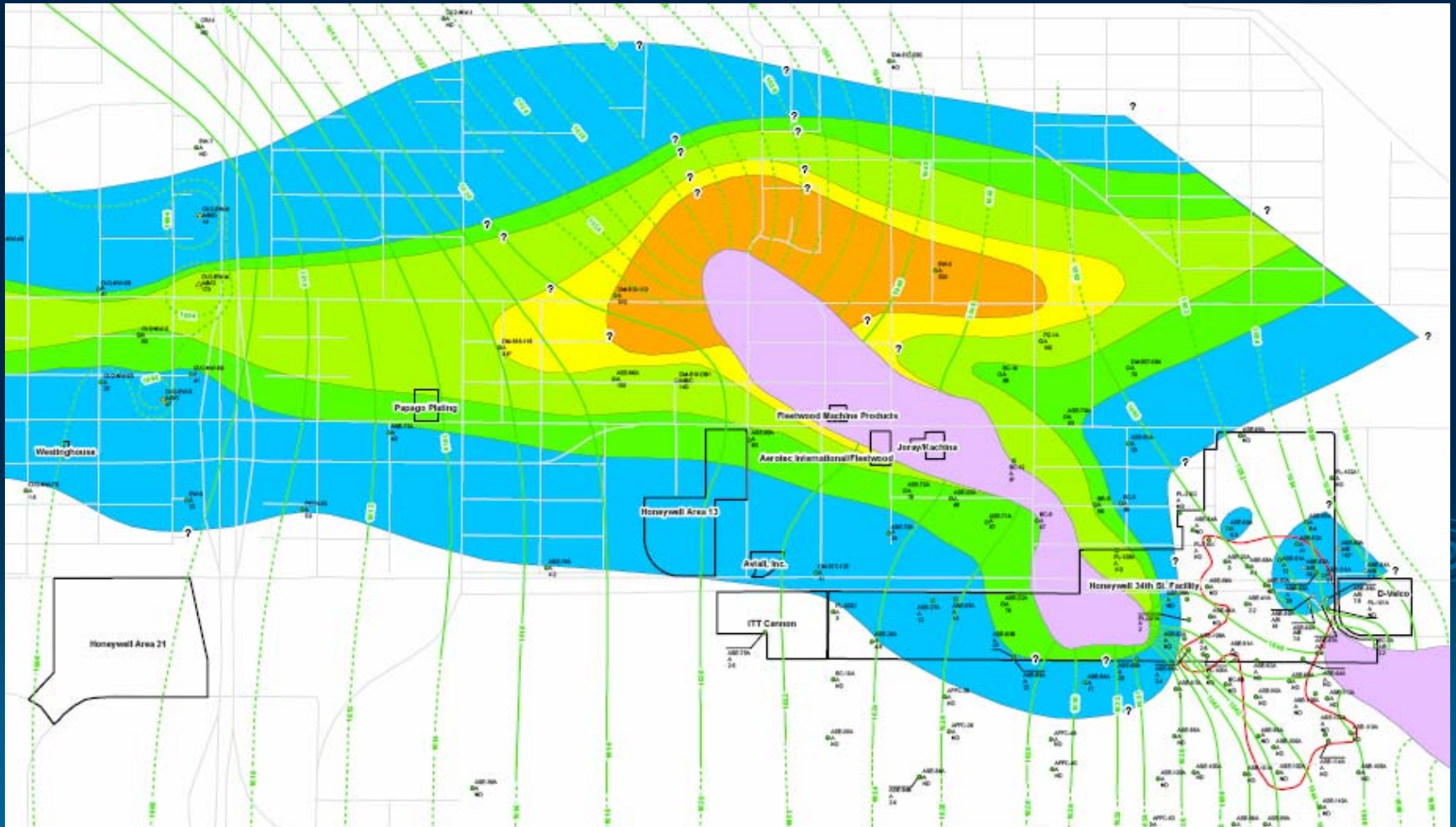


OU2: REVIEW GROUNDWATER DATA

- Future issue: stagnation zones at Honeywell Bedrock Ridge demonstrated with EVS...

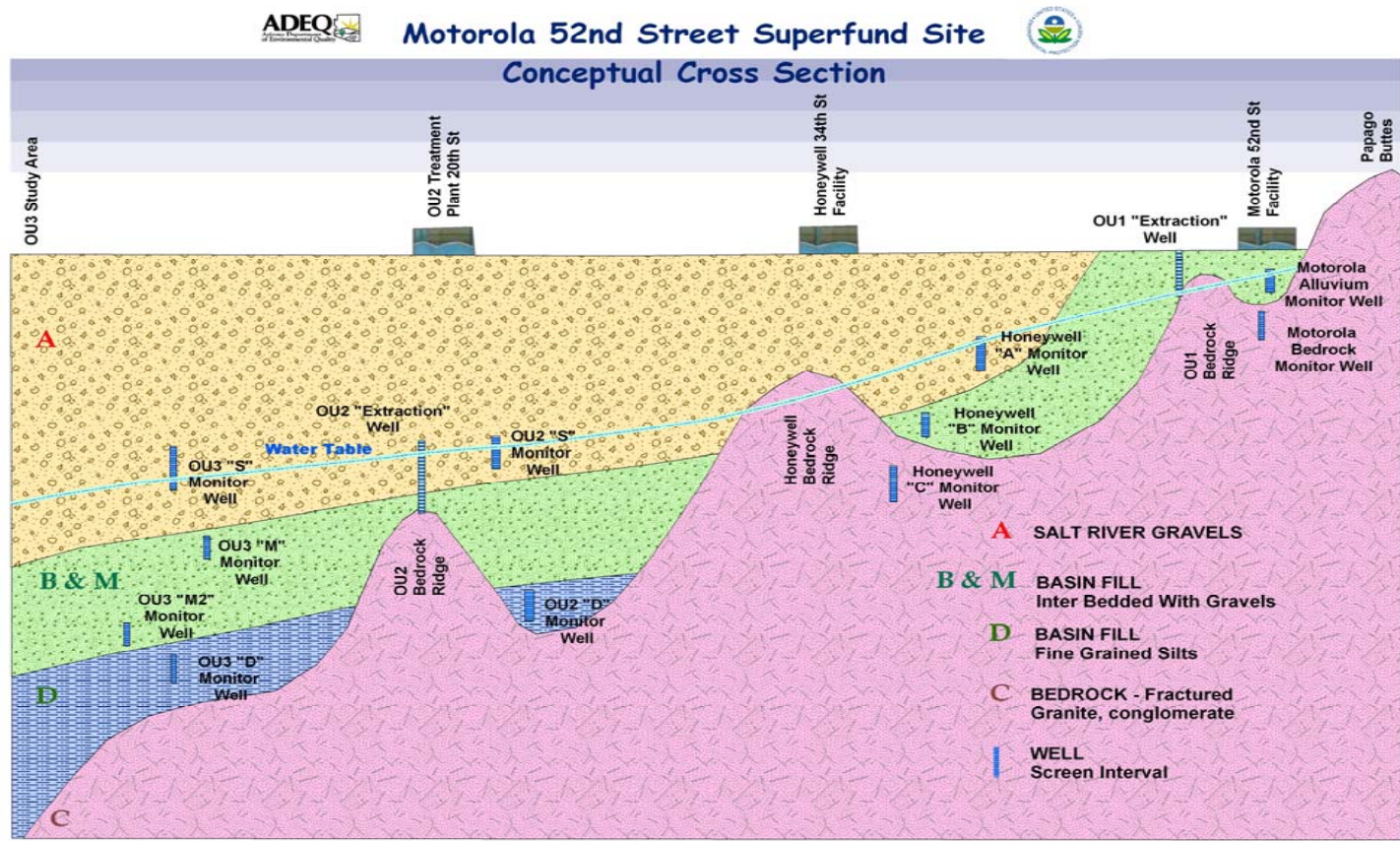
OU2: REVIEW GROUNDWATER DATA

- Future issue: integration with Honeywell jet fuel plume remediation



OU2: HYDROGEOLOGIC DATA GAPS

Sub-unit Aquifer Test



Layer sequence determined by ADEQ

Kristina Paschall: Project Manager
David Haag: Project Hydrologist
TS Summers: GIS

Note: Drawing Not to Scale

OU2: ISSUES

- Data gaps
- Groundwater capture
- Future issues
 - Declining groundwater levels
 - Sub-unit D capture
 - Stagnation zones at Honeywell Bedrock Ridge
 - Hydrogeologic data gaps – aquifer tests
 - OU2 is an interim remedy – final needed
- Indoor air risk evaluation
- Elevated boron concentrations
- Hydrogeologic interpretation issues

OU2: FOLLOW-UP ACTIONS

- Work Plan to address data gaps
- Conservative data interpretation for capture evaluations
- Monitor EW-S extraction rates
- Develop a plan to monitor capture to the south, particularly in sub-unit D
- Prepare a plan to evaluate effectiveness of OU2 GWTF on the stagnation zones
- Develop a plan for long-term aquifer tests in sub-units B and D
- Final OU2 remedy will need to incorporate Honeywell jet fuel remedy and any other OU2 remedies
- ADEQ and EPA are currently developing methodology to evaluate indoor air risk
- Analyze effluent samples for boron and evaluate
- Hold a Technical Work Group (TWG) meeting to resolve outstanding issues

OU2: PROTECTIVENESS STATEMENT

- *A protectiveness determination of the OU2 interim remedy cannot be made at this time until further information is obtained. The necessary follow-up actions and recommendations identified in this Report are needed to evaluate protectiveness. The actions will require the efforts of the Companies and the Agencies to be completed. It is expected that these actions will take approximately 1 year to complete at which time a protectiveness determination will be made.*

Q & A

Any questions or comments?



FINAL CALL TO THE PUBLIC

- Topics for the next meeting?
- Dates for the next meeting?

Future Meeting Plans/ Agenda Discussion

December 2006

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

January 2007

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			